UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

January 22, 2018

MEMORANDUM

SUBJECT: Military Ocean Terminal Sunny Point MPRSA 103 Evaluation Decision Memo

FROM: Gary W. Collins GWC 1/23/18

THRU: Wade Lehmann 1/23/18

TO: File

This memorandum serves to document EPA Region 4's (EPA or the Agency) independent determination whether the dredged material from the Military Ocean Terminal Sunny Point (MOTSU) meets the Ocean Dumping Criteria (ODC). The Wilmington District, U.S. Army Corps of Engineers is seeking an independent evaluation and concurrence under Section 103 of the Marine Protection, Research, and Sanctuaries Act (MPRSA or the Act) of 1972, as amended, and 40 CFR Parts 220-228. This memo provides a description of the project, EPA's analysis of the application per Section 103 requirements and the implementing regulations, and EPA's conclusion. EPA's review is based upon authorities provided to the Agency under the Act and the implementing regulations, as well as supported by guidance found in the Evaluation of Dredged Material Proposed for Ocean Disposal (Green Book, USEPA and USACE, 1991) and the Southeast Regional Implementation Manual (SERIM, USEPA and USACE, 2008).

A - Summary and Conclusions

The Wilmington District has performed a Tier III evaluation according to the SERIM on behalf of the applicant, MOTSU, and determined that the material meets the ODC, with specific load restrictions. EPA has determined that the material does comply with the ODC. This determination is based upon a review of multiple sources of information, which are summarized in Section C. Specified release zones and associated load restrictions that have to be met to comply with the ODC are discussed in Section C, Water Column Determinations as well as Section D.

B - Project Description

In October 2017, the Wilmington District prepared and submitted a MPRSA Section 103 to support a determination by the USACE that maintenance material from the MOTSU would be suitable for ocean disposal. This determination was made by completion of Tier III testing. Authorized project depths, advanced maintenance, and allowable over-depth dredging for each portion of the project are described in detail in the following paragraphs.

Project depth is -38 feet mean, lower low water (MLLW) plus 2 feet of overdepth throughout the project except for the north basin, which is dredged to -34 feet MLLW plus 2 feet of overdepth, and the security

boat dock (located on the southern end of the north basin) which is dredged to -12 feet MLLW plus 2 feet of overdepth. Advanced maintenance is not authorized for this project.

The MOTSU facilities are made up of three interconnected basins. Even though there are three entrance channels which link each basin to the main channel, only the southern and central entrance channels are routinely maintained. The annual average volume of maintenance material from the north, central, and south basin, along with the entrance channels, is approximately 1 million cubic yards. Work may be done by either mechanical dredge, hydraulic dredge, or a combination of both.

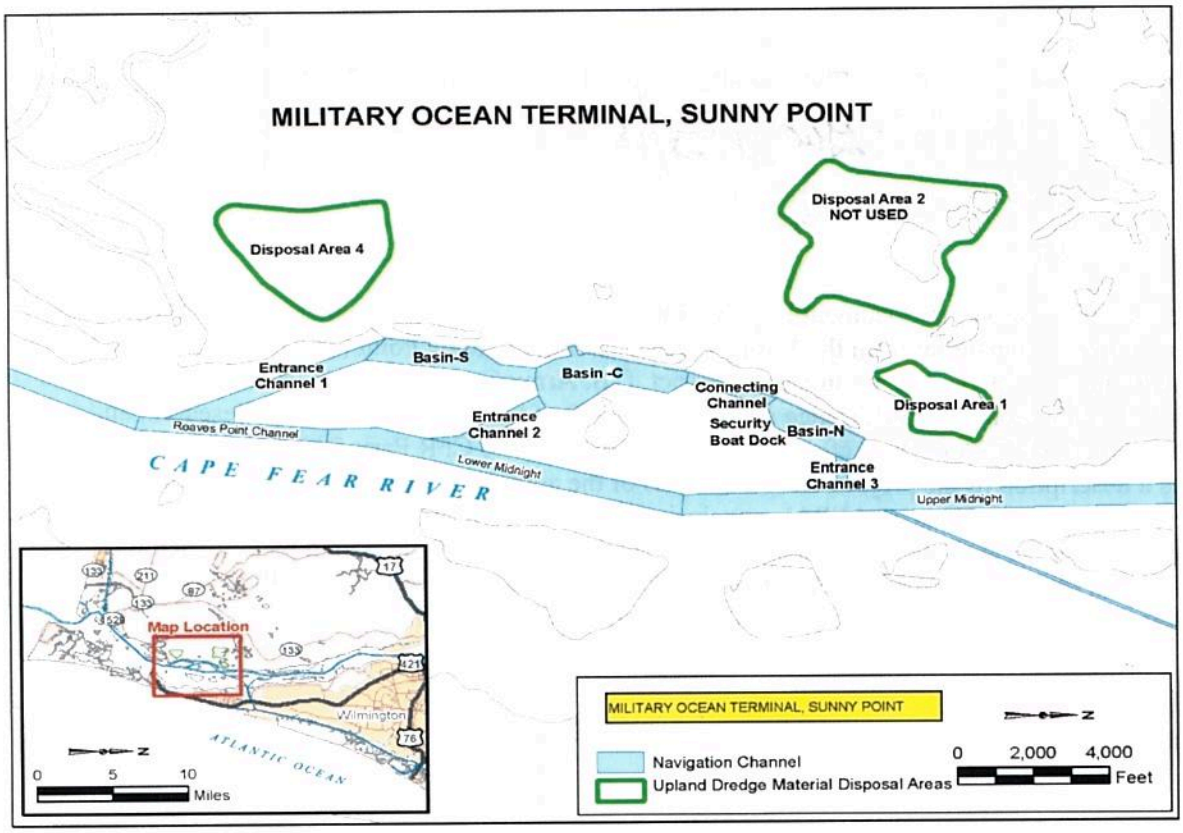

Figure 1. Map of Military Ocean Terminal, Sunny Point.

Table 1. Dredging Units, Project Elevation and Volumes, and Number of Subsamples

Dredging Unit	Project Depth	Estimated Volume	Number of Samples
MOTMA17-N (North Basin and Security Boat Dock)	-34 feet MLLW + 2 ft allowable overdepth	1,000,000 cy (across all three dredging units)	1 composite of 5 subsamples Subsamples are identified as -a through -e
MOTMA17-S (South Basin)	-38 feet MLLW + 2 ft allowable overdepth		1 composite of 5 subsamples Subsamples are identified as -a through -e
MOTMA17-C (Center Basin)	-38 feet MLLW + 2 ft allowable overdepth		1 composite of 5 subsamples Subsamples are identified as -a through -e

Table 2. Military Ocean Terminal, Sunny Point – Grain Size Distribution. (2017)

Sample ID	Grain Size Distribution (percent by weight)			USCS Soil Class
	Gravel	Total Sand	Silt & Clay	
MOTMA17-N	2.9	22.8	74.3	CH
MOTMA17-C	0.0	9.3	90.7	CH
MOTMA17-S	0.0	9.3	90.7	CH

C - EPA's Analysis of the Application

Below is EPA Region 4's independent evaluation of the criteria based on the MPRSA regulations and utilizing data from the Section 103 Evaluation report.

Exclusionary Criteria – 40 CFR §227.13(b)

"*Dredged material which meets the criteria set forth in the following paragraphs (b)(1), (2), or (3) of this section is environmentally acceptable for ocean dumping without further testing under this section:*

(1) The dredged material is comprised predominantly of sand, gravel, rock, or any other naturally occurring bottom material with grain sizes larger than silt, and the material is found in areas of high current or wave energy.

(2) Dredged material is for beach nourishment or restoration and is comprised predominantly of sand, gravel, or shell with particle sized comparable with material on the receiving beaches.

(3) The material proposed for placement is substantially the same as the substrate at the proposed disposal site and the site from which the material proposed for disposal is far removed from known existing and historical sources of pollution as to provide reasonable assurance that such material has not been contaminated by such pollution."

Grain sizes of the material from MOTSU proposed for ocean dumping did not meet the exclusionary conditions specified in (1) and (2), or (3) for exclusion from further testing. Therefore, the proposed dredged material from MOTSU did not meet the exclusionary criteria and had to undergo further testing to determine compliance.

Water Column Determinations – 40 CFR §§227.6(c)(1) and 227.27(a)

Evaluation of the liquid phase – Water Quality Criteria

40 CFR §227.6

(c) The potential for significant undesirable effects due to the presence of these constituents shall be determined by application of results of bioassays on liquid, suspended particulate, and solid phases of wastes according to procedures acceptable to EPA, and for dredged material, acceptable to EPA and the

Corps of Engineers. Materials shall be deemed environmentally acceptable for ocean dumping only when the following conditions are met:

(1) The liquid phase does not contain any of these constituents in concentrations which will exceed applicable marine water quality criteria after allowance for initial mixing; provided that mercury concentrations in the disposal site, after allowance for initial mixing, may exceed the average normal ambient concentrations of mercury in ocean waters at or near the dumping site which would be present in the absence of dumping, by not more than 50 percent;

40 CFR §227.27

(a) The limiting permissible concentration of the liquid phase of a material is:

(1) That concentration of a constituent which, after allowance for initial mixing as provided in §227.29, does not exceed applicable marine water quality criteria; or, when there are no applicable marine water quality criteria,

(2) That concentration of waste or dredged material in the receiving water which, after allowance for initial mixing, as specified in §227.29, will not exceed a toxicity threshold defined as 0.01 of a concentration shown to be acutely toxic to appropriate sensitive marine organisms in a bioassay carried out in accordance with approved EPA procedures.

(3) When there is reasonable scientific evidence on a specific waste material to justify the use of an application factor other than 0.01 as specified in paragraph (a)(2) of this section, such alternative application factor shall be used in calculating the LPC.

Applicable marine water quality criteria must not be exceeded after initial mixing (see Section 3.2.1, SERIM, 2008). For ocean dumping evaluations, the acute concentrations [Criterion Maximum Concentration (CMC)] are used. The applicant compared the contaminants of concern (COC) to the CMC, and found that each dredging unit had an ammonia concentration that exceeded the CMC.

Table 3. Elutriate Results for Ammonia Compared to CMC.

MOTMA17-N	MOTMA17-C	MOTMA17-S	CMC
8.06	6.38	7.19	4.89

Only the worse-case scenario needs to be modeled. In this case, 8.06 requires a dilution of 1.65 in order to be below the CMC of 4.89 (calculated) and therefore meet the LPC.

The following table provides the results from STFATE modeling (water quality module) and the dilutions achieved within the ODMDS after 4 hours and outside the ODMDS at all times. The dilution needed to meet the LPC is 1.65.

Table 4. Results from STFATE modeling – MOTSU.

Depth (ft)	Max Conc. Above Background on Grid (µg/L)	Dilution on Grid ($D_{a\text{-}wq}$)	X Location	Z Location	Time, hours	Max Conc. Outside Disposal Area (µg/L)	Dilution on Grid ($D_{a\text{-}wq}$)
Tier II Ammonia with Unrestricted Disposal							
Sample	MOTMA17-N (Hopper @ 20,000 cy)						
10	7.43E-04	>100,000	16,100	25,200	4	49	163
25	12.2	660	16,100	25,200	4	61.2	131
35	71.2	112	16,100	25,200	2.17	362	21
45	9.64	835	16,100	25,200	2.17	91.4	87
Sample	MOTMA17-N (Mechanical @ 15,000 cy)						
10	2.18E-04	>100,000	16,100	25,200	4	49	163
25	5.96	1351	16,100	25,200	4	55	146
35	40.5	198	16,100	25,200	2.17	235	33
45	5.48	1470	16,100	25,200	2.17	74.2	108

EPA determines that that the water quality criteria aspect of the Limiting Permissible Concentration (LPC)(40 CFR §227.27(a)(1)) would be met.

Evaluation of the liquid phase - Liquid Phase Bioassay

Like the water quality criteria component of the LPC, the liquid phase bioassay results also indicated the liquid phase component of the LPC would be met. Liquid phase bioassays run as part of the suspended particulate phase on three appropriate sensitive marine organisms must show that after initial mixing (as determined under 40 CFR §227.27(a)(2)), the liquid phase of the material must not exceed a toxicity threshold of 0.01 of a concentration shown to be acutely toxic to appropriate sensitive marine organisms. Bioassays utilizing three species (*Americamysis bahia*, *Menidia beryllina* and *Mytilus galloprovincialis*) were conducted. The estimated LC_{50} values for both the *A. bahia and M. beryllina* tests were >100% for all treatments. In the *M. galloprovincialis* test, the estimated EC_{50} values for the standard treatments ranged from 40.5% to 63.5%. Ammonia concentrations in the bulk sediment were sufficiently elevated to predict ammonia-related impacts in the elutriate tests using the larval mussels. Based on the ammonia observations, elutriates were prepared with ammonia-reduced sediments for three of the six project samples and were tested concurrently with the standard elutriate preparations. Normal development and survivorship greatly increased in all of the ammonia-reduced treatments. Mean survivorships in all of the ammonia-reduced 100% elutriate treatments were not significantly different than that of the control or site water samples. The estimated EC_{50} values were greater than 100% for all samples following ammonia reduction. Observed toxicity in all test treatments was ameliorated by the ammonia-reduction procedures. For this reason, the normal application factor of 0.01 was replaced by 0.05. The resultant dilutions needed were 99 for each of the three dredging units.

STFATE model results indicated that the necessary dilutions were achieved after 4 hours and at all times outside the disposal site for all three dredging units but only for restricted disposal (both location within the ODMDS as well as load volume restrictions). Results for the water column tests are summarized in Table 5.

Table 5. Water Column Bioassay Results Summary.

Sample	Endpoint Result (%)		
	Americamysis bahia Survival LC_{50}	*Menidia beryllina* Survival LC_{50}	*M. galloprovincialis* Normal Survival EC_{50}
MOTMA17-N	>100	>100	40.5
MOTMA17-C	>100	>100	43.8
MOTMA17-S	>100	>100	63.5

The sediment physical characteristics for project samples were used to calculate the volumetric fractions. Other inputs for the ADDAMS model were taken from Appendix G of the SERIM. The bioassay results were run through the model under three different disposal scenarios. The first was unrestricted disposal for both mechanical and hydraulic dredges utilizing the recommended disposal point as depicted in Appendix G of the SERIM. However, the resulting load restrictions were extremely severe and highly inefficient. The second scenario (Restricted 1) utilizes a restricted disposal zone in the western portion of the ODMDS, which allows for greater dilution before the plume exits the ODMDS. The third scenario (Restricted 2) also uses a restricted disposal zone in the same area as the first but is slightly smaller and more westerly restricted.

Summaries of the mixing computation results after 4 hours of mixing (specified for water column evaluation) for each dredging unit are given in the following tables.

Table 6. Mixing Computation Results

Depth, feet	% Max Conc. Above Background on Grid	Dilution on Grid ($D_{a\text{-}tox}$)	X Location	Z Location	Time, hours	Max Conc. Outside Disposal Area	Dilution (Da-tox)
Hopper/Cutter with Unrestricted Disposal Location							
Sample	MOTMA17-N (1,500 cy)						
10	6.90E-11	>100,000	16,100	25,900	4	6.90E-11	>100,000
25	1.97E-03	50760	16,100	25,900	4	1.97E-03	50760
37	1.22E-01	819	16,100	25,900	2	8.56E-01	116
45	1.65E-02	6060	16,100	25,900	2	1.16E-01	861
Sample	MOTMA17-C (1,500 cy)						
10	8.42E-11	>100,000	16,100	25,200	4	8.42E-11	>100,000
25	2.29E-03	43667	16,100	25,200	4	2.29E-03	43667
37	1.39E-01	718	16,100	25,200	2.17	8.35E-01	119
45	1.89E-02	5290	16,100	25,200	2.17	1.13E-01	884
Sample	MOTMA17-S (1,500 cy)						
10	8.46E-11	>100,000	16,100	25,200	4	8.46E-11	>100,000
25	2.29E-03	43667	16,100	25,200	4	2.29E-03	43667
37	1.39E-01	718	16,100	25,200	2.17	8.33E-01	119
45	1.88E-02	5318	16,100	25,200	2.17	1.13E-01	884
Hopper/Cutter with Restricted Disposal Location Scenario 1							

Depth, feet	% Max Conc. Above Background on Grid	Dilution on Grid ($D_{a\text{-}tox}$)	X Location	Z Location	Time, hours	Max Conc. Outside Disposal Area	Dilution (Da-tox)
For the restricted disposal area, NW refers to the northwest corner of the ODMDS disposal area, and SE refers to the southeast corner of the ODMDS disposal area.							
Sample	MOTMA17-N (9,000 cy) (NW)						
10	2.48E-07	>100,000	2,100	21,000	4	2.48E-07	>100,000
25	4.18E-02	2391	2,100	21,000	4	4.18E-02	2391
36	4.91E-01	203	2,100	21,000	1.83	9.82E-01	101
45	6.65E-02	1503	2,100	21,000	1.83	1.33E-01	751
Sample	MOTMA17-N (9,000 cy) (SE)						
10	2.29E-07	>100,000	28,700	22,400	4	2.29E-07	>100,000
25	3.86E-02	2590	28,700	22,400	4	3.86E-02	2590
36	4.54E-01	219	28,700	22,400	3.17	8.03E-01	124
45	6.14E-02	1628	28,700	22,400	3.17	1.09E-01	916
Sample	MOTMA17-C (9,000 cy) (NW)						
10	2.81E-07	>100,000	2,100	21,000	4	2.81E-07	>100,000
25	4.80E-02	2082	2,100	21,000	4	4.80E-02	2082
36	5.67E-01	175	2,100	21,000	2.17	9.60E-01	103
45	7.68E-02	1301	2,100	21,000	2.17	1.30E-01	768
Sample	MOTMA17-C (9,000 cy) (SE)						
10	2.55E-07	>100,000	28,700	22,400	4	2.55E-07	>100,000
25	4.79E-02	2087	28,700	22,400	4	4.36E-02	2293
36	5.15E-01	193	28,700	22,400	3.17	9.66E-01	103
45	6.97E-02	1434	28,700	22,400	3.17	1.31E-01	762
Sample	MOTMA17-S (9,000 cy) (NW)						
10	2.82E-07	>100,000	2,100	21,000	4	2.82E-07	>100,000
25	4.52E-03	22123	2,100	21,000	4	4.79E-02	2087
36	5.64E-01	176	2,100	21,000	2.17	9.76E-01	101
45	7.64E-02	1308	2,100	21,000	2.17	1.32E-01	757
Sample	MOTMA17-S (9,000 cy) (SE)						
10	2.57E-07	>100,000	28,700	22,400	4	2.57E-07	>100,000
25	4.36E-02	2293	28,700	22,400	4	4.36E-02	2293
36	5.14E-01	194	28,700	22,400	3.17	9.57E-01	103
45	6.95E-02	1438	28,700	22,400	3.17	1.29E-01	774
Mechanical with Unrestricted Disposal Location							
Sample	MOTMA17-N (3,500 cy)						
10	2.60E-09	>100,000	16,100	25,200	4	2.60E-09	>100,000
25	6.30E-03	15872	16,100	25,200	4	6.30E-03	15872
36	1.72E-01	580	16,100	25,200	2.17	9.54E-01	104
45	2.33E-02	4291	16,100	25,200	2.17	1.29E-01	774
Sample	MOTMA17-C (2,000 cy)						
10	3.68E-10	>100,000	16,100	25,200	4	3.68E-10	>100,000
25	3.51E-03	28489	16,100	25,200	4	3.51E-03	28489
37	1.51E-01	661	16,100	25,200	2.17	8.75E-01	113

Depth, feet	% Max Conc. Above Background on Grid	Dilution on Grid ($D_{a\text{-}tox}$)	X Location	Z Location	Time, hours	Max Conc. Outside Disposal Area	Dilution (Da-tox)
45	2.04E-02	4901	16,100	25,200	2.17	1.18E-01	846
Sample	MOTMA17-S (2,500 cy)						
10	1.05E-09	>100,000	16,100	25,200	4	1.05E-09	>100,000
25	4.87E-03	20533	16,100	25,200	4	4.87E-03	20533
36	1.65E-01	605	16,100	25,200	2.17	9.33E-01	106
45	2.23E-02	4483	16,100	25,200	2.17	1.26E-01	793
Mechanical with Restricted Disposal Location Scenario 1							
For the restricted disposal area, NW refers to the northwest corner of the ODMDS disposal area, and SE refers to the southeast corner of the ODMDS disposal area.							
Sample	MOTMA17-N (9,000 cy) (NW)						
10	2.27E-07	>100,000	2,100	21,000	4	2.27E-07	>100,000
25	3.09E-02	3235	2,100	21,000	4	3.09E-02	3235
36	3.40E-01	293	2,100	21,000	1.83	7.65E-01	130
45	4.60E-02	2173	2,100	21,000	1.83	1.03E-01	970
Sample	MOTMA17-N (9,000 cy) (SE)						
10	2.12E-07	>100,000	28,700	22,400	4	2.12E-07	>100,000
25	2.88E-02	3471	28,700	22,400	4	2.88E-02	3471
36	3.16E-01	315	28,700	22,400	3.17	5.42E-01	184
45	4.28E-02	2335	28,700	22,400	3.17	7.33E-02	1363
Sample	MOTMA17-C (8,000 cy) (NW)						
10	2.22E-07	>100,000	2,100	21,000	4	2.22E-07	>100,000
25	3.65E-02	2739	2,100	21,000	4	3.65E-02	2739
36	4.26E-01	234	2,100	21,000	1.83	9.43E-01	105
45	5.77E-02	1732	2,100	21,000	1.83	1.28E-01	780
Sample	MOTMA17-C (8,000 cy) (SE)						
10	2.07E-07	>100,000	28,700	22,400	4	2.07E-07	>100,000
25	3.41E-02	2932	28,700	22,400	4	3.41E-02	2932
36	3.98E-01	250	28,700	22,400	3.17	6.80E-01	146
45	5.38E-02	1858	28,700	22,400	3.17	9.20E-02	1086
Sample	MOTMA17-S (9,000 cy) (NW)						
10	4.23E-07	>100,000	2,100	21,000	4	4.23E-07	>100,000
25	4.21E-02	2374	2,100	21,000	4	4.21E-02	2374
35	4.21E-01	237	2,100	21,000	1.83	9.88E-01	100
45	5.70E-02	1753	2,100	21,000	1.83	1.34E-01	745
Sample	MOTMA17-S (9,000 cy) (SE)						
10	3.94E-07	>100,000	28,700	22,400	4	3.94E-07	>100,000
25	3.92E-02	2550	28,700	22,400	4	3.92E-02	2550
35	3.92E-01	254	28,700	22,400	3.17	6.70E-01	148
45	5.31E-02	1882	28,700	22,400	3.17	9.07E-02	1102
Hopper/Cutter with Restricted Disposal Location Scenario 2							
For the restricted disposal area, NW refers to the northwest corner of the ODMDS disposal area, and SE refers to the southeast corner of the ODMDS disposal area.							

Depth, feet	% Max Conc. Above Background on Grid	Dilution on Grid ($D_{a\text{-}tox}$)	X Location	Z Location	Time, hours	Max Conc. Outside Disposal Area	Dilution (Da-tox)
Sample	MOTMA17-N (12,000 cy) (NW) Scenario 2						
10	2.54E-06	>100,000	4,200	20,300	4	2.49E-06	>100,000
25	8.68E-02	1151	4,200	20,300	4	8.49E-02	1177
35	6.29E-01	158	4,200	20,300	4	6.16E-01	161
45	8.52E-02	1173	4,200	20,300	4	8.33E-02	1199
Sample	MOTMA17-N (12,000 cy) (SE) Scenario 2						
10	8.83E-07	>100,000	28,700	21,700	4	8.83E-07	>100,000
25	6.05E-02	1652	28,700	21,700	4	6.05E-02	1652
35	5.41E-01	184	28,700	21,700	3.5	8.24E-01	120
45	7.32E-02	1365	28,700	21,700	3.5	1.12E-01	892
Sample	MOTMA17-C (12,000 cy) (NW) Scenario 2						
10	2.86E-06	>100,000	4,200	21,000	4	2.86E-06	>100,000
25	9.99E-02	1000	4,200	21,000	4	9.99E-02	1000
35	7.29E-01	136	4,200	21,000	4	7.29E-01	136
45	9.87E-02	1012	4,200	21,000	4	9.87E-02	1012
Sample	MOTMA17-C (12,000 cy) (SE) Scenario 2						
10	9.76E-07	>100,000	28,700	22,400	4	9.76E-07	>100,000
25	6.83E-02	1463	28,700	22,400	4	6.83E-02	1463
35	6.14E-01	162	28,700	22,400	3.5	9.69E-01	102
45	8.31E-02	1202	28,700	22,400	3.5	1.31E-01	762
Sample	MOTMA17-S (12,000 cy) (NW) Scenario 2						
10	2.84E-06	>100,000	4,200	21,000	4	2.84E-06	>100,000
25	9.91E-02	1008	4,200	21,000	4	9.91E-02	1008
35	7.23E-01	137	4,200	21,000	4	7.23E-01	137
45	9.79E-02	1020	4,200	21,000	4	9.79E-02	1020
Sample	MOTMA17-S (12,000 cy) (SE) Scenario 2						
10	9.76E-07	>100,000	28,700	22,400	4	9.76E-07	>100,000
25	6.80E-02	1470	28,700	22,400	4	6.80E-02	1470
35	6.10E-01	163	28,700	22,400	3.5	9.62E-01	103
45	8.26E-02	1210	28,700	22,400	3.5	1.30E-01	768
Mechanical with Restricted Disposal Location Scenario 2							
For the restricted disposal area, NW refers to the northwest corner of the ODMDS disposal area, and SE refers to the southeast corner of the ODMDS disposal area.							
Sample	MOTMA17-N (12,000 cy) (NW)						
10	8.41E-07	>100,000	4,200	20,300	4	7.86E-07	>100,000
25	4.54E-02	2202	4,200	20,300	4	4.24E-02	2357
35	3.77E-01	264	4,200	20,300	4	3.53E-01	282
45	5.11E-02	1956	4,200	20,300	4	4.78E-02	2091
Sample	MOTMA17-N (12,000 cy) (SE)						
10	8.41E-07	>100,000	28,700	21,700	4	8.41E-07	>100,000
25	4.54E-02	2202	28,700	21,700	4	4.54E-02	2202
35	3.77E-01	264	28,700	21,700	3.5	5.62E-01	177
45	5.11E-02	1956	28,700	21,700	3.5	7.60E-02	1315
Sample	MOTMA17-C (12,000 cy) (NW)						

Depth, feet	% Max Conc. Above Background on Grid	Dilution on Grid ($D_{a\text{-}tox}$)	X Location	Z Location	Time, hours	Max Conc. Outside Disposal Area	Dilution (Da-tox)
10	1.40E-06	>100,000	4,200	20,300	4	1.32E-06	>100,000
25	6.50E-02	1537	4,200	20,300	4	6.12E-02	1633
35	5.16E-01	193	4,200	20,300	4	4.86E-01	205
45	6.98E-02	1432	4,200	20,300	4	6.58E-02	1519
Sample	MOTMA17-C (12,000 cy) (SE)						
10	1.40E-06	>100,000	28,700	21,700	4	1.40E-06	>100,000
25	6.50E-02	1537	28,700	21,700	4	6.50E-02	1537
35	5.16E-01	193	28,700	21,700	3.5	7.70E-01	129
45	6.98E-02	1432	28,700	21,700	3.5	1.04E-01	961
Sample	MOTMA17-S (12,000 cy) (NW)						
10	1.52E-06	>100,000	4,200	20,300	4	1.43E-06	>100,000
25	6.14E-02	1628	4,200	20,300	4	5.76E-02	1735
35	4.68E-01	213	4,200	20,300	4	4.39E-01	227
45	6.33E-02	1579	4,200	20,300	4	5.94E-02	1683
Sample	MOTMA17-S (12,000 cy) (SE)						
10	1.52E-06	>100,000	28,700	21,700	4	1.52E-06	>100,000
25	6.14E-02	1628	28,700	21,700	4	6.14E-02	1628
35	4.68E-01	213	28,700	21,700	3.5	6.94E-01	143
45	6.33E-02	1579	28,700	21,700	3.5	9.40E-02	1063

The specific coordinates for the three different disposal scenarios are detailed in the Section 103 Evaluation document. The permissible load volumes for each dredge type are specified in the following table and are specific to each disposal scenario.

Table 7. Summary of Permissible Load Volumes for MOTSU.

Dredge Unit (Sample ID)	Unrestricted Scenario		Restricted Scenario 1		Restricted Scenario 2	
	Hopper/ Cutter (cy)	Mechanical (cy)	Hopper/ Cutter (cy)	Mechanical (cy)	Hopper/ Cutter (cy)	Mechanical (cy)
MOTSU17-N	1,500	3,500	9,000	9,000	12,000	12,000
MOTSU17-C	1,500	2,000	9,000	8,000	12,000	12,000
MOTSU17-S	1,500	2,500	9,000	9,000	12,000	12,000

Because the model predicted that the needed dilutions would be achieved, it can be concluded that the liquid phase toxicity component of the LPC would be met when the load volumes from Table 7 are not exceeded. Accordingly, EPA determined that the liquid phase of the material would comply with 40 CFR §§227.6(c)(1) and 227.27(a), as defined in the Section 103 Evaluation documentation.

Suspended Particulate Phase Determination - 40 CFR §§ 227.6(c)(2) and 227.27(b)

40 CFR § 227.6(c)

(2) Bioassay results on the suspended particulate phase of the waste do not indicate occurrence of significant mortality or significant adverse sublethal effects due to the dumping of wastes containing the constituents listed in paragraph (a) of this section. These bioassays shall be conducted with appropriate sensitive marine organisms as defined in §227.27(c) using procedures for suspended particulate phase bioassays approved by EPA, or, for dredged material, approved by EPA and the Corps of Engineers. Procedures approved for bioassays under this section will require exposure of organisms for a sufficient period of time and under appropriate conditions to provide reasonable assurance, based on consideration of the statistical significance of effects at the 95 percent confidence level, that, when the materials are dumped, no significant undesirable effects will occur due to chronic toxicity of the constituents listed in paragraph (a) of this section;

40 CFR § 227.27

(b) The limiting permissible concentration of the suspended particulate and solid phases of a material means that concentration which will not cause unreasonable acute or chronic toxicity or other sublethal adverse effects based on bioassay results using appropriate sensitive marine organisms in the case of the suspended particulate phase, or appropriate sensitive benthic marine organisms in the case of the solid phase; and which will not cause accumulation of toxic materials in the human food chain. Suspended particulate phase bioaccumulation testing is not required. These bioassays are to be conducted in accordance with procedures approved by EPA, or, in the case of dredged material, approved by EPA and the Corps of Engineers.

To summarize the regulations above, suspended particulate phase bioassay testing of the material -- using three appropriate sensitive marine organisms -- must show that after initial mixing (as determined under 40 CFR §227.29(a)(2)) the suspended particulate phase of this material would not exceed a toxicity threshold of 0.01 of a concentration shown to be acutely toxic in the laboratory bioassays, and thus would not result in significant mortality. The factor of 0.01 is applied to ensure that there will be no significant adverse sublethal effects. The testing design and procedures used for water column toxicity evaluations result in a medium of 100 % of the liquid phase plus the suspended phase in the test chambers as the same time (see Section 11.1.4, Green Book, 1991). This allows for evaluation of the liquid and suspended phases from the same test results. The same bioassays and subsequent results are used for both the liquid and suspended phase compliance determinations. The results of these tests are discussed in the previous section and apply to the suspended phase as well. Because the results indicated that the liquid phase toxicity component of the LPC would be met, EPA also determined that the suspended phase criteria would be met.

Accordingly, EPA determined that the suspended phase of the material would comply with 40 CFR 227.6(c)(2) and 227.27(b).

Benthic Determinations – 40 CFR §§227.6(c)(3) and 227.27(b)

40 CFR §227.6(c)

(3) Bioassay results on the solid phase of the wastes do not indicate occurrence of significant mortality or significant adverse sublethal effects due to the dumping of wastes containing the constituents listed in paragraph (a) of this section. These bioassays shall be conducted with appropriate sensitive benthic marine organisms using benthic bioassay procedures approved by EPA, or, for dredged material, approved by EPA and the Corps of Engineers. Procedures approved for bioassays under this section will require exposure of organisms for a sufficient period of time to provide reasonable assurance, based on considerations of statistical significance of effects at the 95 percent confidence level, that, when the materials are dumped, no significant undesirable effects will occur due either to chronic toxicity or to bioaccumulation of the constituents listed in paragraph (a) of this section;

40 CFR §227.27

(b) The limiting permissible concentration of the suspended particulate and solid phases of a material means that concentration which will not cause unreasonable acute or chronic toxicity or other sublethal adverse effects based on bioassay results using appropriate sensitive marine organisms in the case of the suspended particulate phase, or appropriate sensitive benthic marine organisms in the case of the solid phase; and which will not cause accumulation of toxic materials in the human food chain. Suspended particulate phase bioaccumulation testing is not required. These bioassays are to be conducted in accordance with procedures approved by EPA, or, in the case of dredged material, approved by EPA and the Corps of Engineers. The solid phase of the material must be evaluated for compliance with Sections 227.6(c)(3) and 227.27(b) using the results of two specific types of evaluations on the solid phase of the material, one focusing on the acute (10-day) toxicity of the material, and the other focusing on the potential for the material to cause significant adverse effects due to bioaccumulation. Both types of tests use appropriate sensitive benthic marine organisms according to procedures approved by USEPA and the USACE.

Solid phase toxicity evaluation

The SERIM requires that benthic phase bioassay testing of the material does not show that toxicity in the dredged material is statistically greater than toxicity measured in the reference sediment, and does not exceed mortality in the reference sediment by more than 10% (20% for the amphipod)(see Section 3.3.2.1, USEPA and USACE, 2008). The applicant conducted ten-day toxicity tests on the project materials using polychaetes (*Neanthes arenaceodentata*) and amphipods (*Ampelisca abdita*), which are appropriate sensitive benthic marine organisms. These organisms are good predictors of adverse effects to benthic marine communities.

The survival of the project sediments for the polychaetes were 98 – 100 %, negating the need for statistical analysis. The survival of the project sediments for the amphipods were 94 - 96 %. Again, there was no need to for statistical analysis. These results (see Table 8) show that the solid phase of the material does not cause significant mortality and meets the solid phase toxicity criteria of §227.6(c)(3) and 227.27(b).

Table 8. Summary of 10-day toxicity tests for project sediments.

	N. arenaceodentata	*A. abdita*
Control	100	97
Reference	100	97
MOTMA17-N	98	96
MOTMA17-C	98	94
MOTMA17-S	100	95

The results demonstrate that the solid phase of the material does not cause significant mortality and therefore meets the solid phase toxicity criteria of §227.6(c)(3) and 227.27(b).

Solid phase bioaccumulation evaluation

The acceptability of the dredged materials proposed for ocean dumping is further confirmed by the results of the solid phase bioaccumulation evaluation. The Green Book describes an approved process of evaluating bioaccumulation potential using comparative analysis of project sediment bioaccumulation to FDA Action Limits, reference sediment bioaccumulation, and evaluation of eight additional factors for assessing the significance of bioaccumulation. The project sediment bioaccumulation test results for each compound of concern are sequentially compared to: (a) FDA Action Limits; (b) reference test results; and, (c) general risk-based evaluations. If the evaluation shows that the project sediment does not exceed (a), the FDA Action Limit for a specific contaminant (or contaminant category), or (b) the reference test results for a particular compound, then such an outcome would indicate that the disposal of the material would not result in adverse effects due to such contaminant(s) or compounds, and there is no need to further evaluate that contaminant(s) or compound(s) in the third step.

Bioaccumulation tests were conducted on the solid phase of the project material for contaminants of concern identified above using two appropriate sensitive benthic marine organisms, *Nereis virens* and *Macoma nasuta*. These species are considered to be good representatives of the phylogenetically diverse base of the marine food chain.

The contaminant(s) or compounds selected by the analyst, after a review of sediment analyses, to be evaluated in a comparison of sample stations with the reference station from bioaccumulation bioassays are summarized below. Both EPA and the USACE were consulted and agreed to the analyst's recommendations summarized below.

Table 9. Summary of contaminant(s) or compounds analyzed for in Bioaccumulation tests.

Analyte	MOTMA17-N	MOTMA17-C	MOTMA17-C	MOTMA17-REF (reference)	Pre-exposure
Antimony	X	X	X	X	X
Arsenic	X	X	X	X	X
Beryllium	X	X	X	X	X
Cadmium	X	X	X	X	X
Chromium	X	X	X	X	X
Copper	X	X	X	X	X
Lead	X	X	X	X	X

Mercury	X	X	X	X	X
Nickel	X	X	X	X	X
Selenium	—	—	—	—	—
Silver	X	X	X	X	X
Thallium	X	X	X	X	X
Zinc	X	X	X	X	X
Organotins	—	—	—	—	—
Pesticides	—	—	—	—	—
PAHs	X	X	X	X	X
PCBs	—	—	—	—	—
Dioxins	—	—	—	—	—
Lipids	—	—	—	—	X

Metals and PAHs were chosen, after a review of sediment analyses, to be evaluated in a comparison of sample stations with the reference from bioaccumulation bioassays. All project and reference tissue samples had five replicates. The mean of results of each set of five replicates per sample and analyte combination was calculated and compared to the mean of the reference tissue result per analyte. Mean values of analyte concentrations were calculated as follows:

- For non-detects/U-flagged data, the method detection limit (MDL) was used in all statistical calculations.
- For J-flagged and non-flagged data, the result was used in all statistical calculations.

In cases where the mean concentration of an analyte in *N. virens* or *M. nasuta* tissue was found to exceed that of the reference tissue and at least two of the five replicate samples had concentrations above the MRL, the biostatistical software program ToxCalc v5.0.32 (Tidepool Scientific LLC) was used to determine the relative distribution and variances among the samples tested. If the distribution was determined to be abnormal or the variances unequal, the data were treated with a reciprocal transformation and the distribution and variances were re-evaluated. If no mean tissue contaminant concentration was found to statistically significantly exceed that of the reference tissue, then no additional analysis is necessary to demonstrate compliance with the LPC.

Comparison to FDA Action Limits

There are FDA Action Limits for the contaminants of concern identified. For the proposed dredged materials, none of the contaminants, for which there are FDA Action Levels, exceed such thresholds in the tissues of organisms exposed to project sediments for 28 days.

Comparison of Bioaccumulation Test Results to Reference Sediment Test Result

Concentrations of contaminants in tissues of organisms exposed for 28 days to project sediments were compared to concentrations in tissues of organisms exposed for 28 days to reference sediment. For the polychaete, *N. virens,* none of the projects tissues statistically exceeded the reference tissues. The incidences of statistically significant bioaccumulation for *M. nasuta* resulting from these exposures are summarized in the following table.

Table 10. Incidences of Project-Exposed tissues statistically exceeding reference tissues.

Analyte	Mean Concentration of Replicates				FDA Action Level: Bivalves	Ecological Effects Threshold: Bivalves	South Atl. Bight Background: Bivalves
	MOTMA17-N	MOTMA17-C	MOTMA17-S	MOTMA17-REF (reference)			
METALS (mg/kg)							
Beryllium	0.0040	0.0039	**0.0054**	0.0040	x	x	<0.19
PAHs (µg/kg)							
Fluoranthene	**7.2**	**5.6**	**6.4**	(1.6)	x	12.8	<20
Pyrene	**5.9**	**5.0**	**5.7**	(1.3)	x	x	<20
Total HMW PAHs	**18**	**15**	**18**	(5.4)	x	x	60
Total PAHs	**46**	**24**	**29**	(13)	x	40000	170

x = No ecological effects threshold published for the given parameter.

Results in bold are statistically significantly greater than those of the reference tissue.

Underlined results indicate that the mean concentration in project tissue is statistically significantly greater than the reference results, and the reference results are below the MRL (see Subsection 7.5.3 of the SERIM for details.)

Results in parentheses (x.x) have less than two replicate results above the MRL.

Sources: Tables 14 and 18 of ANAMAR (2017)

Because there were no cases where tissues exceeded South Atlantic Bight (background) values for bivalves, there is no need to further evaluate through use of the eight factors.

Therefore, it is determined that there is no potential for undesirable effects due to bioaccumulation as a result of the presence of individual chemicals or of the solid phase of the dredged material as a whole. Accordingly, it is concluded that the solid phase of the material proposed for disposal meets the ocean disposal criteria at 40 CFR §227.6(c)(3) and 227.27(b).

D - Conclusion

The Tier 3 testing and evaluation conducted by the Wilmington District for MOTSU has demonstrated that the material proposed for ocean dumping meets the ODC.

The permit, as well as the project construction contract specifications, will contain conditions to insure disposal is in compliance with the New Wilmington ODMDS SMMP. In addition, the District, or applicant, will perform pre-and post-disposal bathymetric surveys and provide disposal summary reports to EPA Region 4 in compliance with the requirements of the SMMP. In order to for the project to be in compliance, the concurrence is conditioned upon the following disposal restrictions being met. Depending upon the use of mechanical or hydraulic means of dredging, load volumes are restricted

according to the following table which specifies where material may be placed and the corresponding load restrictions associated with each scenario.

Table 11. Volume Restrictions based on STFATE modeling.

Dredge Unit (Sample ID)	Unrestricted Scenario		Restricted Scenario 1		Restricted Scenario 2	
	Hopper/ Cutter (cy)	Mechanical (cy)	Hopper/ Cutter (cy)	Mechanical (cy)	Hopper/ Cutter (cy)	Mechanical (cy)
MOTSU17-N	1,500	3,500	9,000	9,000	12,000	12,000
MOTSU17-C	1,500	2,000	9,000	8,000	12,000	12,000
MOTSU17-S	1,500	2,500	9,000	9,000	12,000	12,000

Unrestricted – 15,750' by 15,750'
Restricted 1 – NW = 1,500' by 11,500'
SE = 28,000' by 13,250'
Restricted 2 - NW = 3,500' by 11,200'
SE = 28,000' by 12,600'

E – References

ANAMAR Environmental Consulting, Inc. 2017. *Final Report, MPRSA Section 103 Sediment Testing of Dredged Material for Ocean Disposal, Military Ocean Terminal Sunny Point, North Carolina.* Report submitted to USACE, Wilmington District, Wilmington, NC.

USEPA and USACE. 1991. *Evaluation of Dredged Material Proposed for Ocean Disposal, Testing Manual [Green Book].* EPA 503-8-91-001. EPA, Office of Marine and Estuarine Protection, Washington, D.C., and Department of the Army, USACE, Washington, D.C.

USEPA and USACE. 2008. *Southeast Regional Implementation Manual (SERIM), Requirements and Procedures for Evaluation of the Ocean Disposal of Dredged Material in Southeast U.S. Atlantic and Gulf Coast Waters.* EPA 904-B-08-001. EPA Region 4, Atlanta, GA, and USACE South Atlantic Division, Atlanta, GA.